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First record of *Phlebia incarnata* from the southern hemisphere

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Abstract — During a survey of xylophilous fungi in the municipality of São Francisco de Paula, in southern Brazil, *Phlebia incarnata*, a species never before recorded for South America, was found. *Phlebia incarnata* has a pileate basidiome with vivid pink coloration, a hymenophore with folds, a monomitic hyphal system, and cylindrical basidiospores. In this work, *P. incarnata* is compared with related species; a full description and illustrations are provided.

Key words — *Meruliaceae, Merulius,* mycodiversity, neotropics

Introduction

The genera *Merulius* Fr. and *Phlebia* Fr. were described by Fries in 1821. Since then, they have both been placed in family *Meruliaceae* P. Karst. (Kirk et al. 2008) and are mainly differentiated by the habit (reflexed to dimidiate in the former and resupinate to effused in the latter). Fries (1821) included 10 species in the genus *Merulius* and later divided it into two sections according to the pigmentation of the basidiospores (Fries 1838). Patouillard (1887) transferred the *Merulius* species with colored spores to the genus *Gyrophora* Pat., and later Karsten (1889) divided *Merulius* into four distinct genera: *Merulius*, *Plicatura* Peck, *Gyrophora,* and *Serpula* (Pers.) Gray. Over the years, further work including these genera has been published (Patouillard 1900, Donk 1964, Parmasto 1968), but none satisfactorily distinguished *Merulius* and *Phlebia*. They only agreed with Karsten's (1889) idea that they were related and difficult to discern due to morphological similarities. Ginns (1975), based on morphological and cultural characters, proposed a new segregation of the species of *Merulius* s.l., keeping

only two species in *Merulius* s.s., *M. tremellosus* Schrad., and *M. incarnatus* Schwein. However, Nakasone & Burdsall (1984), who morphologically and culturally compared the type species of *Merulius* and *Phlebia* (*M. tremellosus* and *P. radiata* Fr.), considered that the differences presented (based on basidiome habit, configuration of the hymenophore, and presence of cystidia and asexual spores in culture) were not sufficient to separate them into two different genera. Consequently they considered *Merulius* a synonym of *Phlebia*.

Using RFLP analysis of 18S rRNA gene fragment and ITS region, Dresler-Nurmi et al. (1999) demonstrated that *Phlebia tremellosa* (Schrad.) Nakasone & Burds. grouped together with *P. ochraceofulva* (Bourdot & Galzin) Donk, *P. centrifuga* P. Karst., and *P. radiata*. Subsequent phylogenetic analysis of the sequences 5.8S, ITS2, and LSU nuclear rDNA by Larsson et al. (2004) showed that *P. tremellosa* is closely related to *P. rufa* (Pers.) M.P. Christ., *P. radiata,* and *P. lindtneri* (Pilát) Parmasto. As *P. tremellosa* and *P. incarnata* are very similar morphologically, and the former groups in the same clade with other *Phlebia* species, it is likely that both belong to this genus instead of *Merulius*, thus supporting the conclusions of Nakasone & Burdsall (1984).

Phlebia is characterized by effuse to effuse-reflex or dimidiate basidiomata with cartilaginous to subgelatinous or ceraceous consistency. Hymenial surfaces can be smooth, tuberculate, odontoid, phlebioid, or merulioid. A monomitic hyphal system and smooth, thin-walled and non-amyloid basidiospores characterize the genus microscopically (Nakasone & Burdsall 1984, Maekawa 1993).

Materials and methods

Specimens were collected in July and September 2009, in the municipality of São Francisco de Paula, Rio Grande do Sul, Brazil. This region is characterized by presenting subtropical vegetation with the presence of the coniferous tree *Araucaria angustifolia* (Bertol.) Kuntze (*Araucariaceae* Henkel & W. Hochst.). The climate in the region is humid subtropical of the Cfb type, according to the Köppen Climate Classification (Moreno 1961).

After the macromorphological analysis, the specimens were dried at room temperature. For microscopy, freehand basidiome sections were mounted in a drop of 5% KOH solution and 1% phloxine solution. Microstructures were drawn aided by a camera lucida. The abbreviations and codes for the measurements are modified from Coelho (2005), where Lm × Wm = means of length and width, Q = range of length/width ratios, Qm = length/width mean, and n = x/y (x = number of measurements from a given number (y) of specimens). The codes used for colors follow Kornerup & Wanscher (1978). The collected specimens are kept at the ICN herbarium (UFRGS).

Taxonomy

Phlebia incarnata (Schwein.) Nakasone & Burds., Mycotaxon 21: 245, 1984 FIGS 1–5

SPECIMEN EXAMINED: BRAZIL. Rio Grande do Sul, municipality of São Francisco de Paula, FLONA, 03.VII.2009, leg. G. Seger 1028 (ICN 154337); 19.IX.2009, leg. G. Seger 1029 (ICN 154388).

BASIDIOMATA annual, pileate, sessile to dimidiate, sometimes slightly effused-reflexed, often imbricate, spongy when fresh becoming hard upon drying, pileus conchate; upper surface tomentose, pinkish to reddish (11A4–12A7) when fresh and pinkish white to reddish blond (7A2–5C3) after dried; margin fimbriate, vivid red (11A8); hymenial surface white (11A1) when fresh, drying dull red (9C4–10B4), folds 0.5–1.0 mm deep, radiating, continuous to the margin, side branches anastomosing forming cavities resembling a pore surface (1–2/mm); context up to 2.0 mm thick, duplex, upper layer loose and spongy, concolorous with the upper surface, lower layer waxy and dense, brownish red (10D6) to dull red (11C4).

HYPHAL SYSTEM monomitic, generative hyphae with clamp connections, 2.0–5.0 µm diam., thin to slightly thick-walled, with wide lumen, amorphous granules present in contextual hyphae; cystidia lacking. Basidia clavate, 4-sterigmate; basidiospores subcylindrical to cylindrical, slightly bent, hyaline, smooth, thin walled, frequently with two oil drops, 4.5–5.5 × 2.0–2.5 µm, Lm × Wm = 5.08 × 2.10, Q = 2.0–2.75, Qm = 2.43, n = 30/1.

CULTURE DESCRIPTION: See Ginns (1975)

SUBSTRATA: On fallen logs of an unknown angiosperm.

DISTRIBUTION: Previously recorded from United States, Mexico (Ginns 1975), and Costa Rica (Halling & Mueller 2006).

ADDITIONAL SPECIMENS EXAMINED: *Phlebia incarnata* – UNITED STATES. North Carolina, Franklin County, Louisburg, 01.II.2003, leg. V. Grand s/n (BPI 844251); Texas,

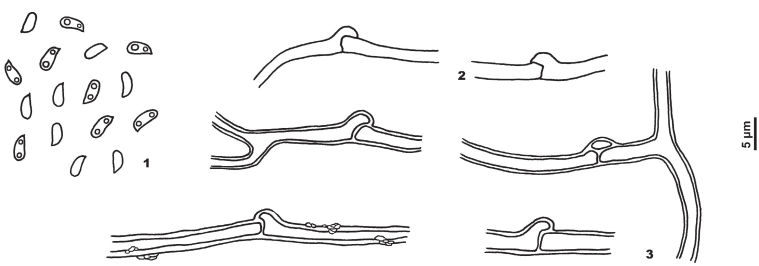

FIG. 1–3. *Phlebia incarnata* (ICN 154337).
1. Basidiospores. 2. Tramal generative hyphae. 3. Contextual generative hyphae.

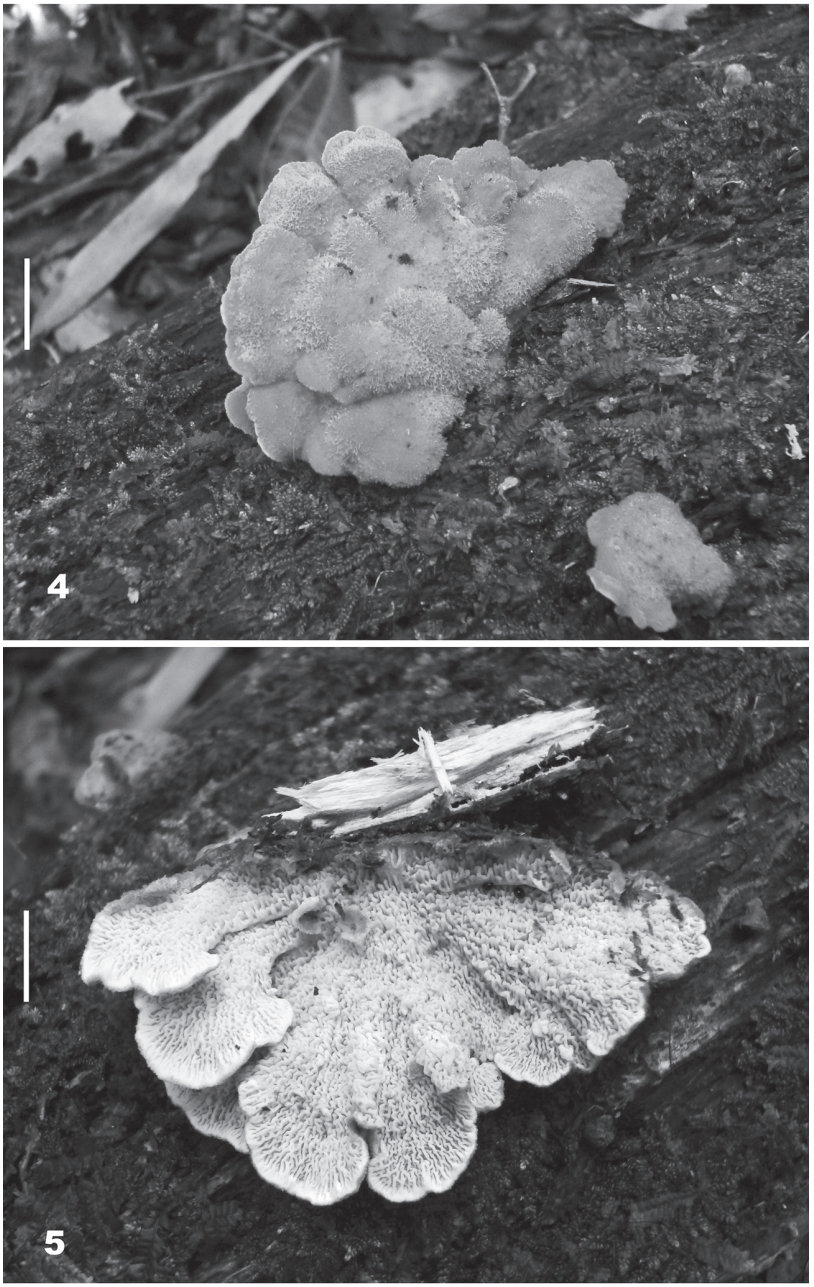

Fig. 4–5. Basidiome of *Phlebia incarnata*. 4. Pileus surface. 5. Hymenophore. Scale bar = 1 cm.

Hardin County, Big Thicket National Preserve, Jack Gore Baygall Unit, 17.XI.2001, leg. D.P. Lewis 6542 (BPI 841954); Virginia, King George County, 7.XI.1972, leg. K.A. Harrison KHM 13344 (BPI 025617). *Phlebia tremellosa* — BRAZIL. Rio Grande do Sul, municipality of Cambará do Sul, Itaimbezinho, II.1981, leg. R.T. Guerrero s/n (ICN 56048 as *Merulius tremellosus*); municipality of São Francisco de Paula, CPCN Pró-Mata, 29.V.2009, leg. M.C. Westphalen 230/09 (ICN 154339); FLONA, 22.VI.2009, M.C. Westphalen 250/09 (ICN 154338).

Remarks: *Phlebia incarnata* is easy to recognize due to its vivid reddish-pink color, spongy basidiomata, and folded hymenophore. Our specimens fit the description given by Ginns (1975), differing only in the fresh hymenial surface color, which in our specimens is white, while Ginns describes it as pale pink. Also, the specimens we examined from BPI herbarium usually presented a glabrous upper surface, sometimes with small hairs in restricted areas, while our material presented a tomentose to somewhat velvety upper surface.

Phlebia tremellosa is a similar species that also occurs in Brazil (Baltazar & Gibertoni 2009). However it presents a white to pallid pileus surface and the hymenial surface has a translucent pale orange-red coloration, which becomes deep orange-red upon drying. Microscopically, *P. tremellosa* can be differentiated by the allantoid basidiospores (4.0–4.5 × 1.0–1.5) and the presence of scattered cystidia imbedded in the hymenium.

According to Ginns (1975), *P. incarnata* frequently grows together with basidiomes of a species of *Stereum* Hill ex Pers. However, in our specimens, we did not observe this association.

This species was previously known only from countries located in the northern hemisphere. Therefore our record represents a significant addition to its biogeography distribution.

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Literature cited

Baltazar JM, Gibertoni TB. 2009. A checklist of the aphyllophoroid fungi (*Basidiomycota*) recorded from the Brazilian Atlantic Forest. Mycotaxon 109: 439–442.

Coelho G. 2005. A Brazilian new species of *Auriporia*. Mycologia 97: 266–270. doi: 10.3852/mycologia.97.1.263

Donk M. 1964. A conspectus of the families of *Aphyllophorales*. Persoonia 3: 199–324.

Dresler-Nurmi A, Kaijalainen S, Lindström K, Hatakka A. 1999. Grouping of lignin degrading corticoid fungi based on RFLP analysis within 18S rRNA and ITS region. Mycological Research 103: 990–996. doi:10.1017/S0953756298008156

Fries EM. 1821. Systema mycologicum, vol. I. 520 p.

Fries EM. 1838. Epicrisis Systematis Mycologici, seu Synopsis Hymenomycetum. Uppsala. Typographia Academica. 608 p.

Ginns JH. 1975. *Merulius*: s.s. and s.l., taxonomic disposition and identification of species. Canadian Journal of Botany 54: 100–167.

Halling RE, Mueller GM. 2006. Macrofungi of Costa Rica (On Line): Available at: http://www.nybg.org/bsci/res/hall/costaric.html

Karsten P. 1889. Kritisk Öfversikt af Finlands Basidsvampar. Bidr. Kiinned. Finl. Nat. Folk 48: 1–470.

Kirk PM, Cannon PF, David JC, Stalpers JA. 2008. Ainsworth and Bisby's dictionary of the fungi. 10th Edition. CABI Publishing. 771 p.

Kornerup A, Wanscher JH. 1978. Methuen handbook of colour. 3rd ed. London (UK): Eyre Methuen.

Larsson K-H, Larsson E, Kõljalg U. 2004. High phylogenetic diversity among corticioid homobasidiomycetes. Mycological Research 108(9): 983–1002. doi: 10.1017/S0953756204000851

Maekawa N. 1993. Taxonomic study of Japanese *Corticiaceae* (*Aphyllophorales*) I. Rep. Tottori Mycol. Inst. 31: 1–149.

Moreno JA. 1961. Clima do Rio Grande do Sul. Secretaria da Agricultura do Rio Grande do Sul. Porto Alegre.

Nakasone KK, Burdsall HH. 1984. *Merulius*, a synonym of *Phlebia*. Mycotaxon 21: 241–246.

Parmasto E. 1968. Conspectus systematis Corticiacearum. Institutum zoologicum et botanicum Academiae scientiarum R.P.S.S. Estonicae. Tartu. 261 p.

Patouillard NT. 1887. Les Hyménomycètes d'Europe. Anatomie et classification des champignons supérieurs (Matériaux pour l'Histoire des Champignons I). Paris. Klincksieck. 166 p.

Patouillard NT. 1900. Essai taxonomique sur les familles et les genres des Hyménomycètes. Lons-le-Saunier. Duclume. 184 p.